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Coastal and Hydraulics Laboratory

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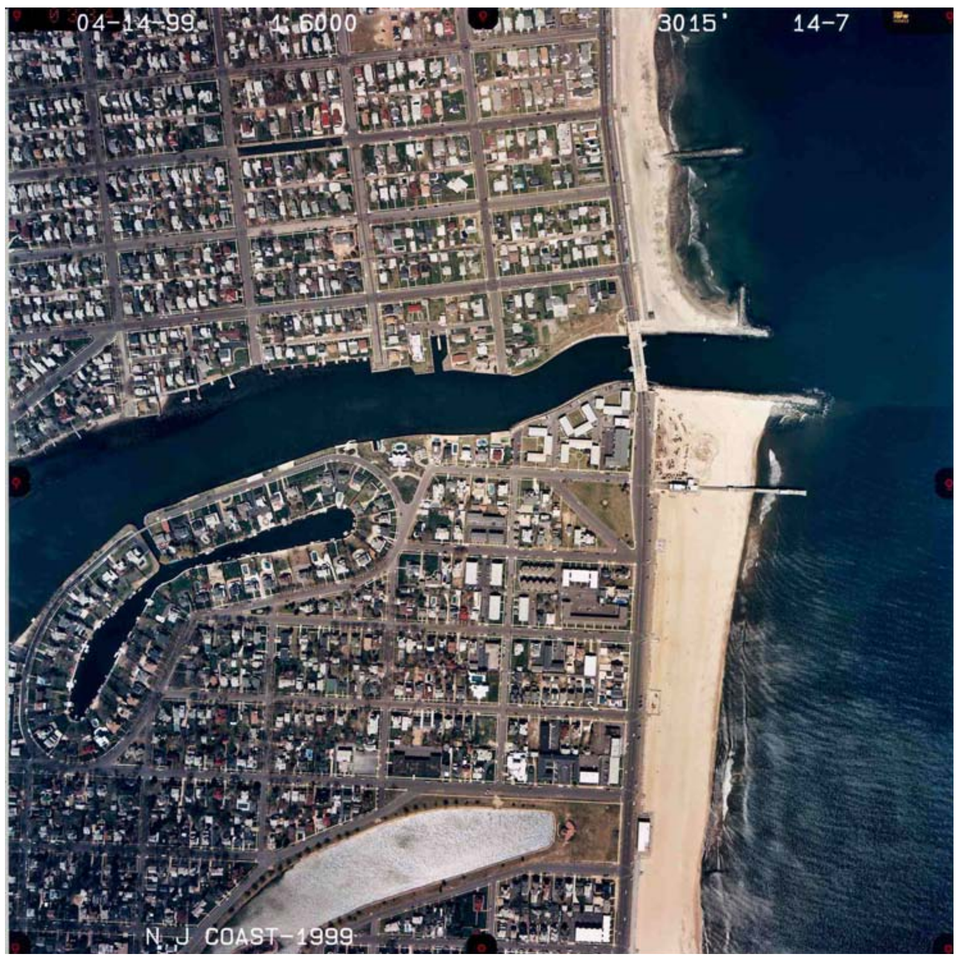
Coastal Inlets Research Program

Shark River Inlet, New Jersey, Entrance Shoaling: Report 1, Desk Study

Nicholas C. Kraus and Mary C. Allison

September 2009



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Cover Photo: Shark River Inlet, NJ, April 1999 (New York District Photograph)

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Shark River Inlet, New Jersey, Entrance Shoaling: Report 1, Desk Study

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Final report

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26 Federal Plaza, Room 2109
New York, NY 10278-0090

Under Dredging Operations Technical Support Program,
and Coastal Inlets Research Program

Monitored by Coastal and Hydraulics Laboratory
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Abstract: This report documents a desk study performed to identify factors responsible for accelerated sand shoaling at the federally maintained entrance channel to Shark River Inlet, NJ. Since the late 1990s, channel maintenance dredging requirements at the inlet have increased. The study was proceeded by review of the engineering literature, analysis of channel and nearshore bathymetry surveys, and application of general principles of coastal and inlet processes. Although Shark River Inlet possesses a small back bay, the current through the inlet is strong because of the narrow width between jetties. In the past century, this coast was sand deficient. With recent beach nourishment projects as part of an erosion-control program, the longshore sand transport potential along the coast is becoming realized, allowing an ebb-tidal shoal to form at the entrance. This shoal is expected to increase in volume over the next two decades to reach about 1.2 million cubic yards. Therefore, the dredging maintenance strategy must transition to one similar to those at other small tidal inlets along the Atlantic Ocean coasts of New Jersey and New York.

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Preface

Shark River Inlet, located on the northern Atlantic Ocean seaboard, has experienced accelerated channel shoaling at its entrance. This study was performed at the request of the U.S. Army Engineer District, New York (hereafter, the New York District), under the Dredging Operations Technical Support (DOTS) Program administered by the U.S. Army Engineer Research and Development Center (ERDC), to determine the cause of the channel shoaling and answer other questions posed by the New York District. Responses under the DOTS Program are intended to provide information and identify solutions in a timely manner within a short time frame, typically representing one or two weeks of effort. The study effort was conducted in the summer of 2008, and was supplemented by information and resources of the Coastal Inlets Research Program, a navigation research and development program of the of Headquarters, U.S. Army Corps of Engineers. This report is an edited version of the project Memorandum for Record submitted to the New York District in September 2008.

This study was performed by Dr. Nicholas C. Kraus, Senior Scientist Group, ERDC, Coastal and Hydraulics Laboratory (CHL) assisted by Mary C. Allison of the Navigation Division, Coastal Engineering Branch (CEB), CHL, in data assemblage and analysis. Dr. Julie Dean Rosati, Flood and Coastal Division, Coastal Processes Branch, CHL, reviewed a preliminary draft of this document. Information and coordination in support of this study, as well as study review, were provided by New York District personnel Lynn M. Bocamazo, Adam B. Devenyi, Patricia Donohue, Joseph Olha, Christina Rasmussen, and John F. Tavolaro. Cooperation of the New York District is acknowledged for willingness to extend the spatial extent of the 9 June 2008 post-dredging survey as an aid in support of this study. J. Holley Messing, CEB, CHL, formatted this report. Work was conducted under the general administrative supervision of Dr. William D. Martin, Director, CHL.

At the time of publication of this report, COL Gary E. Johnston, EN, was Commander and Executive Director. Dr. James R. Houston was Director.

Unit Conversion Factors

Multiply	By	To Obtain
acres	0.404685642	hectares
cubic feet	0.02831685	cubic meters
cubic yards	0.7645549	cubic meters
feet	0.3048	meters
square feet	0.09290304	square meters

1 Introduction

The desk study reported herein of the cause of accelerated sand shoaling in the Federal navigation channel at the entrance of Shark River Inlet, NJ, was performed at the request of the U.S. Army Engineer District, New York (hereafter, the New York District). A comprehensive follow-on study is anticipated that will establish a numerical simulation model for aiding in decisions on channel maintenance and regional sand management.

Background of study

This study was performed under the Dredging Operations Technical Support (DOTS) Program administered by the U.S. Army Engineer Research and Development Center (ERDC). DOTS Program responses are intended to provide information and identify solutions in a short time frame, typically representing one or two weeks of effort. The work was supplemented by methodologies and information from the Coastal Inlets Research Program. Specific questions posed by the New York District were:

1. What is the cause of the accelerated and rapid shoaling at Shark River Inlet?
2. What short-term strategies can be employed to alleviate the shoaling problem and help keep the channel cleared for as long a period of time as possible?
3. What long-term possible solutions will optimally help to keep the channel clear?

These questions were addressed primarily through analysis of channel and nearshore bathymetry surveys. The resultant channel infilling and morphology change were interpreted through knowledge of coastal and inlet processes at the site.

Site overview

Shark River Inlet is located in Monmouth County, NJ, and is the southernmost coastal inlet maintained by the New York District (Figures 1 and 2). There is no significant river flow to the estuary, which is fed by several small streams. The inlet is served by a federally maintained navigation channel connecting the estuary of the Shark River and the Atlantic Ocean.

Figure 1. Shark River Inlet entrance, NJ, inset area photographed 13 April 2003.

Figure 2. Shark River Inlet entrance, NJ, 1 October 2006.

The inlet is stabilized by two parallel rock jetties, owned and maintained by the State of New Jersey. Two curved jetties were constructed in 1915 and, between 1948 and 1951, the State rebuilt and realigned the jetties to extend straight to the ocean (Angas 1960). Although these jetties have

experienced maintenance since 1951, the parallel configuration has continued with the north and south jetties, 525 ft and 950 ft long, respectively, and 300 ft apart. A 500-ft-long shore-parallel external spur extends northward from the north jetty and was built to protect the landward end of the jetty during northeasters. The Federal navigation project includes the entrance channel, which is 18 ft deep and 150 ft wide, from the Atlantic Ocean to a point 500 ft landward of the inlet, connecting to a channel 12 ft deep and 100 ft wide into the bay.

The vertical datum is mean low water (MLW), tied to a historic project benchmark on land. Therefore, it is likely that the New York District is at present providing a half-foot or more of extra depth because of sea level rise on this coast. Sediment dredged from the bay side channel consists primarily of fine-grained material that is unsuitable for bypassing to the ocean beach.

2 Coastal and Inlet Processes

The northern Atlantic coast of New Jersey has experienced a severe sediment (sand) deficiency for the past century, resulting in loss of beaches, placement of dense numbers of sand-retention structures such as groins, bulkheads, and seawalls, and overall winnowing of finer sand to leave a coarser lag. The beach profile has steepened in approach to equilibrium with the coarser sand. The regional, long-term trend of longshore sand transport on this coast is from south to north (Angas 1960, Caldwell 1966). Until about the year 2000, the ocean entrance to Shark River Inlet required minor, infrequent maintenance dredging (every 7 to 10 years). Subsequent to year 2000, the New York District surveys indicated shoaling across the inlet, first from the south and then from the north.

Coastal processes

The long-term net potential longshore sand transport rate has been estimated at around 200,000 cu yd/year to the north and the gross transport rate at 910,000 cu yd/year (New York District 2006). The gross transport rate is the sum of the north- and south-directed rates. The gross transport rate contributes to the shoaling of littoral material into a navigation channel. Long-term net and gross rates correspond to potential longshore transport and can only be realized if sand is fully available to be transported in the littoral zone. Material will bypass the channel as well as deposit in it, because shallow channels are not complete traps to littoral transport.

As part of the Sea Bright to Manasquan Inlet Beach Erosion Control Project, in 1997, the New York District placed approximately 3 million cu yd of fine-to-medium sand to the south of Shark River Inlet. During 1999-2000, another 3 million cu yd of sand was placed to the north of the inlet. The sand was taken from offshore sources. In addition, long groins in the Borough of Spring Lake, located south of the inlet, were notched (lowered in elevation) near the shore to promote sand movement into a local erosion hot spot and straighten the local shoreline, with associated placement of about 225,000 cu yd of sand in the autumn of 2002 (Bocamazo et al. 2003). Construction of the Erosion Control Project and notching of the groins provided sand to at least partially if not completely reestablish natural longshore sand transport potential. The General Design Memoranda for the Erosion Control Project (New York District

1995a and b) anticipated increased shoaling and an increase in the frequency of dredging to approximately every 2 to 3 years at the entrance to Shark River Inlet, owing to increased availability of sand for transport.

Angas (1960) documents that the south (up-drift) jetty had impounded considerable sand volume along the beach adjacent to it, in contrast to the beach to the north, which was severely eroded. Therefore, in 1958 and 1959, a sand bypassing project was conducted at Shark River Inlet by excavation with a crane and transport by truck. At the time of writing the 1960 paper, a target volume of 225,000 cu yd was expected to be bypassed. More than half of this amount, 137,000 cu yd, had been bypassed in the first winter season. This bypassing action is in accord with present estimates of both the direction and volume of net longshore sand transport. The paper also notes that in the past, a bar tended to form around the south jetty, directed to the north. However, any material bypassed was believed to arrive to the shore much farther north than the area directly down drift that was deprived of sand and not benefit the beach adjacent to the north jetty.

Inlet processes

Shark River Inlet cannot be classified as a river mouth because it does not experience notable freshwater flow that would contribute to maintaining inlet stability. The entrance serves a relatively small bay complex estimated at 800 acres. Jarrett (1976) found a tidal prism of 1.48×10^8 cu ft, channel cross-sectional area of 3.00×10^3 sq ft, and width to depth (hydraulic radius) ratio of 17. The ebb current in this inlet is known to be strong, making navigation and surveying difficult, but the marinas in the bay are well protected and experience calm water. The unusually strong current is attributed to the small entrance width to depth ratio, one of smallest of 108 U.S. inlets and the smallest among 35 Atlantic coast inlets tabulated by Jarrett (1976). The average tidal range is about 4 ft, but spring tide can exceed 5.5 ft.

According to a commonly applied empirical relation (Walton and Adams 1976), the tidal prism at Shark River Inlet can support an ebb shoal (sometimes referred to as an entrance bar) of 1.2 million cu yd at equilibrium, if sand is available. An ebb shoal at a small inlet will take one or two decades to form (Kraus 2000), and will be composed of sand that would otherwise reside on the beach. Inlets on the northern New Jersey and Long Island, NY, coasts tend to be wave dominated, as opposed to tide dominated. Wave dominance means, for the present discussion, that the ebb shoal will

be roughly horseshoe-shaped around the jetties. Formation of ebb shoals is normally calculated as part of the sand budget developed in the planning of new inlets to be opened; the need for accounting for this new sand volume at an existing inlet is unusual. The ebb shoal will begin to bypass sand as it develops. Approaching maturity or equilibrium volume, an ebb shoal will naturally bypass most of the sand arriving to it unless the sand is intercepted by a maintained navigation channel, which would trap some portion. That portion could be bypassed mechanically or hydraulically during periodic channel maintenance.

The ebb shoal is expected to grow to reach a total volume of about 1.2 million cu yd. Based on findings of Buonaiuto and Kraus (2003), who developed an empirical relation for the limiting depth at ebb shoals, the minimum depth over the mature ebb shoal at Shark River Inlet is predicted to be about 11 ft MLW. However, data in their work for Moriches Inlet and Shinnecock Inlet, NY, both maintained by the New York District, fell below the trend line of best-fit curves of the complete data set. It may be that the strong ebb flow and high waves at wave-dominated inlets create a narrower, more-confined ebb shoal of greater elevation. The 23 May 2008 bathymetry shows a controlling depth of approximate 6 ft across the entrance.

3 Study Procedure

This study relied on bathymetry surveys provided by the New York District, and also on two surveys made by the Coastal Inlets Research Program prior to completion of the Erosion Control Project.

Shoreline position in the vicinity of the inlet, from April 1994 to October 2006, was examined from aerial photography made available by the New York District, as summarized in Figure 3. The shoreline was interpreted as the visually identified wet-dry line, without tidal (water level) correction. The figure shows that the shoreline adjacent to the south jetty has been fully impounded, apart from seasonal change, similar to the situation described by Angas (1960). The shoreline adjacent to the north jetty advanced subsequent to the renourishment in 1999-2000, and the segment of shoreline behind the spur also varies in position, but maintains an advanced position protecting the landward base of the jetty. The seaward positions of the shoreline on both sides of the inlet suggest that sand can readily enter its entrance or move onto the newly formed ebb shoal. The large impoundment area adjacent to the south jetty indicates a consistent net longshore sand transport to the north.

Bathymetry analysis is summarized in a series of depth contour maps derived from survey data from 1995 to June 2008, and compiled in Appendix A. The maps have the same elevation (depth) scale and horizontal scale, and also include a large scale for surveys encompassing a greater longshore extent. The following observations are made based on these survey data:

1. The 1995 and June 1998 surveys do not indicate the presence of an ebb-tidal shoal. The 1995 survey documents a jetty tip shoal emerging from the south jetty (see also the May 1999 survey), whereas in the June 1998 survey, this shoal is absent and replaced by one on the north jetty. This morphologic change in shoal locations is attributable to seasonal changes in wave direction. The 1995, 1998, and, to a lesser extent, the 1999 surveys show a deep and clear entrance from the tips of the jetties to the Ocean Avenue Bridge.

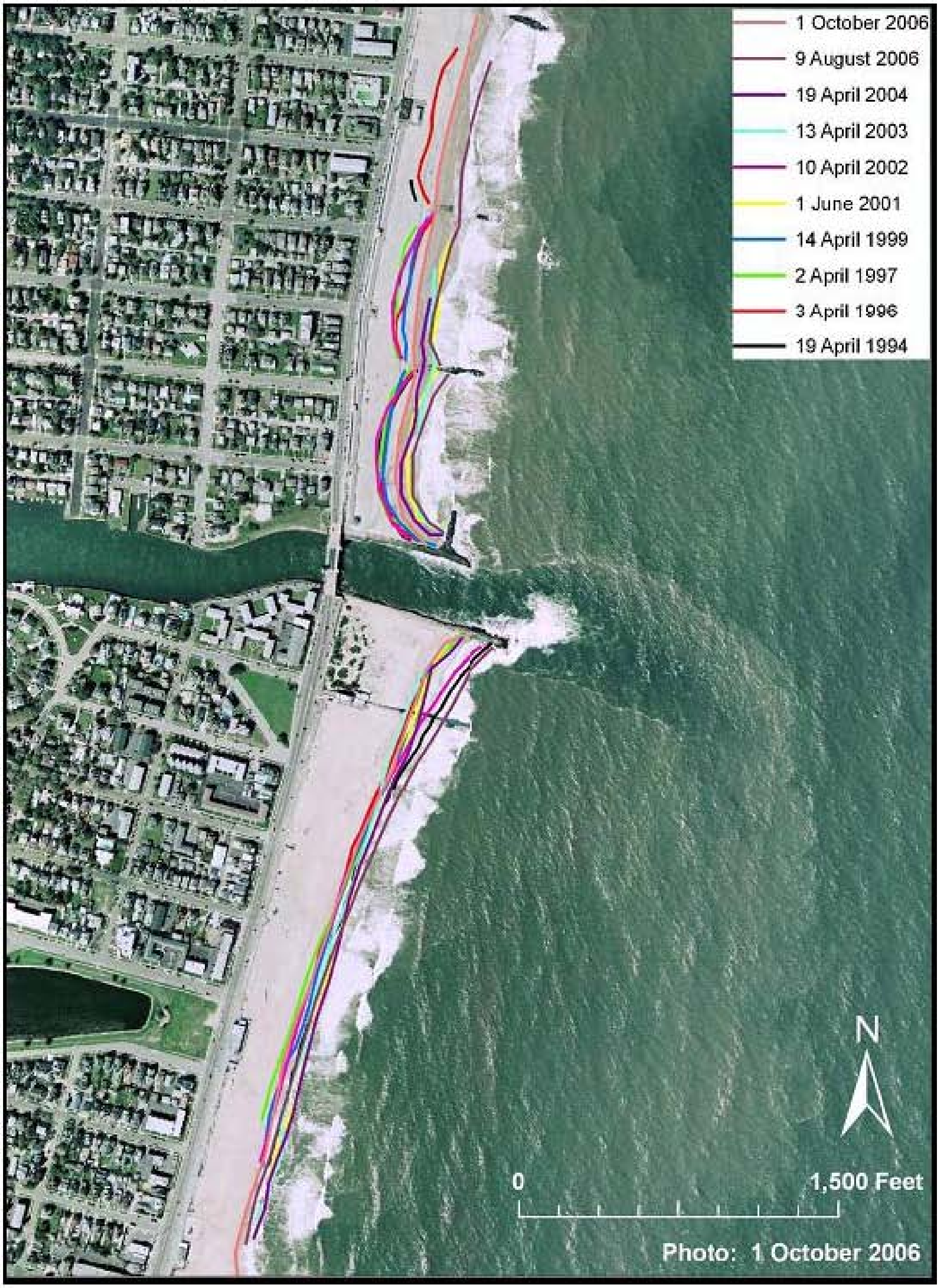

Figure 3. Shoreline change at Shark River Inlet entrance, NJ, 1994-2006.

2. The April 2000 survey, made after renourishment of both the south beach (1997) and the north beach (1999-2000), indicates shoal encroachment from both north and south, with considerable sand entering the entrance margin on the north by April 2000.

3. The March-April 2002 survey and the December 2002 before-dredging surveys indicate variable, but continued encroachment into the channel by jetty-tip shoals.

4. The after-dredging survey of January 2003 shows a cleared channel, but with shoals directly adjacent to it. High waves incident from either the north or south and their associated current would push sand along these shoals and into the channel, as seen in the July 2003 Condition Survey. The July 2003 survey indicates the formation of an entrance bar, part of the horseshoe-shaped ebb shoal morphology characteristic of wave-dominated inlets. The August 2003 and April 2004 surveys continue in demonstrating the trend of ebb shoal development.

5. The June and December 2005, and the May and November 2006 surveys indicate continued ebb shoal development and transport of sand into the inlet entrance. The ebb current is strong under the Ocean Avenue Bridge and clears the channel in its vicinity. The May 2006 survey reveals sand waves over the ebb shoal; these sand waves are formed perpendicular to the dominant current and are indirect evidence of a strong current that can transport sand across the shoal and inlet entrance.

6. Surveys of March and August 2007 are consistent with the 2005-2006 surveys concerning ebb shoal development. Also, a persistent morphologic feature, seen as a transverse or diagonal bar, is observed to have formed across the inlet (first seen in the April-May 2002 surveys), running from the tip of the north jetty to the landward end of the south jetty and intersection with the bridge. The transverse bar is in part caused by the tendency of the ebb current exiting from under the north side of the bridge to clear sand in its area of influence; the sand then deposits as the current velocity decreases. However, the source of sand in the channel is expected to be littoral (marine) in origin and not fluvial or bay derived.

7. The 2008 surveys show a cyclic channel dredging followed by shoal encroachment. The wider area June 2008 survey indicates broad plateaus of sand arched toward the channel on both sides. The horseshoe-shaped ebb shoal is now attaching to the shore on both sides of the inlet. This ebb shoal morphology contrasts to the lack of morphologic relief in the survey of June 1998.

4 Conclusions

Based on observations and analysis as described above, the following are answers to the questions posed by the New York District within the scope of a short-term desk study.

What is cause of accelerated and rapid shoaling?

The increased shoaling rate is undoubtedly caused by the presence of an entrance bar, also called an ebb-tidal shoal, which formed subsequent to renourishment of the adjacent beaches as part of the Erosion Control Project. Prior to the beach nourishment, an ebb shoal was not present at Shark River Inlet because it was on a chronically sand-deprived coast. After the nourishment, the ebb shoal started to grow from both the south (long-term up-drift side) and north (long-term down-drift side). Spit growth and the growth of morphologic features, extending from a sand source, by the longshore current begin through the establishment of a sand platform at the sea bed. At Shark River Inlet, this platform has now been established and can serve as a bridge for sand continuing to form the ebb shoal and bypass the inlet. Therefore, the increased shoaling rate is expected to become the long-term norm.

What short-term strategies can be employed to alleviate shoaling problems and help keep the channel cleared for as long a period of time as possible?

For the short term (the next several years), the addition of channel wideners to the offshore portion of the entrance channel is recommended, which will perhaps increase the channel width by 50 ft on each side or 50 ft on the south side and 25 ft on the north side. The wideners would act as a deposition basin and function to trap sand moving collectively, thereby preventing the sudden loss of authorized depth by, for example, sudden shoal encroachment during a storm. Dredged sand should be bypassed according to existing New York District operating procedure, which places the material in the nearshore north of the inlet. Numerical modeling of coastal and inlet processes, beyond the scope of this study, would be required to optimize the wideners and in general establish a quantitative predictive basis for channel maintenance and sand bypassing, both natural and mechanical, as part of channel maintenance dredging within a regional sand management approach.

What long-term possible solutions will optimally help to keep the channel clear?

If maintenance (renourishment) of neighboring beaches continues, the ebb shoal will continue to grow. Optimization of channel wideners, based upon experience, would probably be the most economical action to increase the interval between dredging actions. The dredging could be incorporated in the renourishment projects as part of the sand bypassing and reestablishment of the littoral connection of the beaches to each side of the inlet.

Two potential concerns were noted in this review that might be investigated in further study and numerical modeling. The first is the unequal lengths of the jetties. It is recognized that the northern New Jersey coast is highly developed with valuable property to either side of the inlet. Dual jetties of unequal length tend to introduce an asymmetry in the local current, waves, sand transport, and morphology change at inlets. Lengthening of the north jetty would maintain the focus of the ebb jet and push the most seaward portion of the ebb shoal further offshore. Consequences of this seaward migration should be carefully evaluated with concern for reduction of natural sand bypassing. Alternatively, the south jetty could be shortened, promoting the functioning of the fishing pier. Infrastructure is encroaching on the beach adjacent to the landward base of the south jetty, and some kind of storm protection level remediation would have to be considered there if the south jetty were shortened. Shortening the south jetty would bring the ebb shoal closer to shore and promote natural sand bypassing.

The second concern is the asymmetry of the ebb current as it issues from beneath the Ocean Avenue Bridge. Survey evidence indicates that this current is directed against the north jetty, a response to the curved inlet configuration to the bay or west side of the bridge. The long-term consequences of this asymmetry for the entrance are unclear, but may threaten the integrity of the north jetty through scour at the base of the structure.

Summary and recommendations

Because of sand infusion to the beaches and nearshore by the Erosion Control Project, the north New Jersey coast is reestablishing sand transport potential. The increased longshore transport capacity on the long stretch of coast can lead to formation of morphologic features such as longshore bars and the ebb tidal shoal at Shark River Inlet. It is

recommended that the New York District investigate the shortest, most economical alongshore distance for placement of bypassed sand so that benefits to the down-drift beach are optimized with a minimal amount of dredged material returning to the navigation channel at Shark River Inlet.

As part of channel maintenance, it is recommended that the New York District continue wider area surveys (beyond the authorized channel banks) to monitor and anticipate migration of large sand shoals into the channel. The entrance channel is expected to orient to the northeast because of the direction of net longshore sand transport, and the District might take advantage of this natural orientation in dredging practice, rather than continue the channel orientation straight to the ocean.

A numerical modeling study is recommended in support of future operation and maintenance actions at Shark River Inlet. The modeling would examine such processes as time scale, plan shape, and volume of the ebb-tidal shoal; optimal channel maintenance strategy; sand bypassing rate as a function of time as the ebb shoal develops; interaction of the inlet entrance and adjacent beaches; possible jetty modifications to reduce channel maintenance and improve navigation safety and reliability; role of channel orientation in minimizing channel dredging; and the functioning of Shark River Inlet within the context of regional sediment processes.

References

Angas, W. M. 1960. Shark River Inlet sand by-passing project. *Journal of the Waterways and Harbors Division* WW3:29-47.

Bocamazo, L. M., K. A. Donohue, B. Williams, and G. Awad. 2003. Groin notching in Spring Lake, New Jersey. *Proceedings Coastal Structures 2003*, ASCE, 935-948.

Buonaiuto, F. S., and N. C. Kraus. 2003. Limiting slopes and depths at ebb-tidal shoals. *Coastal Engineering* 48:51–65.

Caldwell, J. M. 1966. Coastal processes and beach erosion. *Journal of the Society of Civil Engineers* 53(5):142-157.

Jarrett, J. T. 1976. *Tidal prism-inlet area relationships*. GITI Report 3. Vicksburg, MS: U.S. Army Engineer Waterways Experiment Station.

Kraus, N. C. 2000. Reservoir model of ebb-tidal shoal evolution and sand bypassing. *Journal of Waterway, Port, Coastal, and Ocean Engineering* 126(3):305-313.

U.S. Army Engineer District, New York. 1989 (revised 1995a). *General design memorandum, Atlantic Coast of New Jersey, Sandy Hook to Barnegat, beach erosion control project, Section I – Sea Bright to Ocean Township, New Jersey*. New York, NY: U.S. Army Engineer District, New York.

U.S. Army Engineer District, New York. 1994 (revised 1995b). *General design memorandum, Atlantic Coast of New Jersey, Sandy Hook to Barnegat, beach erosion control project, Section II – Asbury Park to Manasquan, New Jersey*. New York, NY: U.S. Army Engineer District, New York.

U.S. Army Engineer District, New York. 2006. *That Atlantic Coast of New Jersey regional sediment budget 1986-2003 Manasquan Inlet to Sea Bright*. Draft Report, April 2006. New York. NY: U.S. Army Engineer District, New York.

Walton, T. L., and W. D. Adams. 1976. Capacity of inlet outer bars to store sand. *Proceedings 15th Coastal Engineering Conference*, ASCE, 1,919-1,937.

Appendix A: Depiction of Channel Surveys

The bathymetric surveys that follow are identified by the dates at the top of the photographs. The background photograph is the same, that of 1 October 2006.

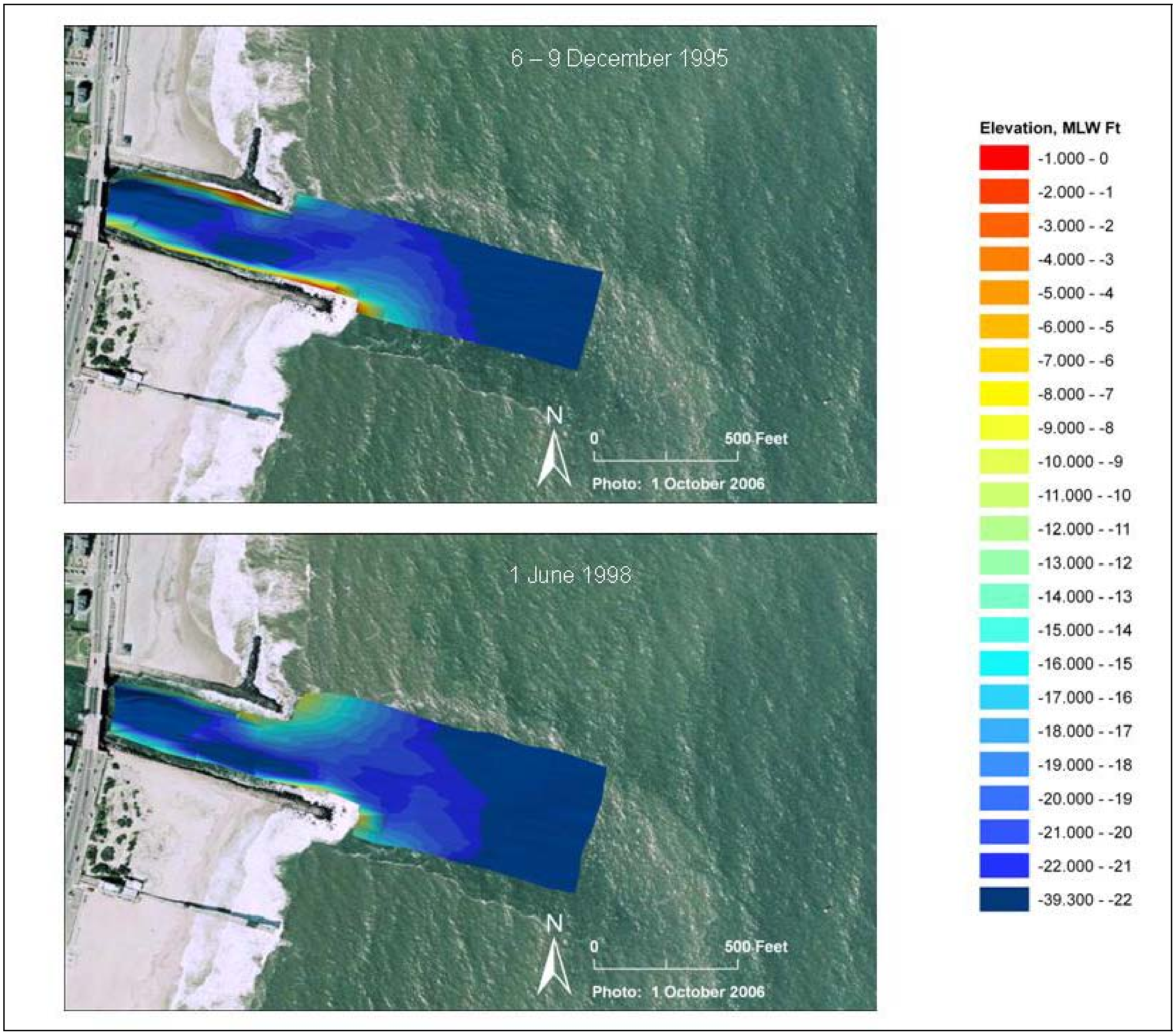

Figure 4. Shark River Inlet entrance, NJ, surveys of December 1995 and June 1996.

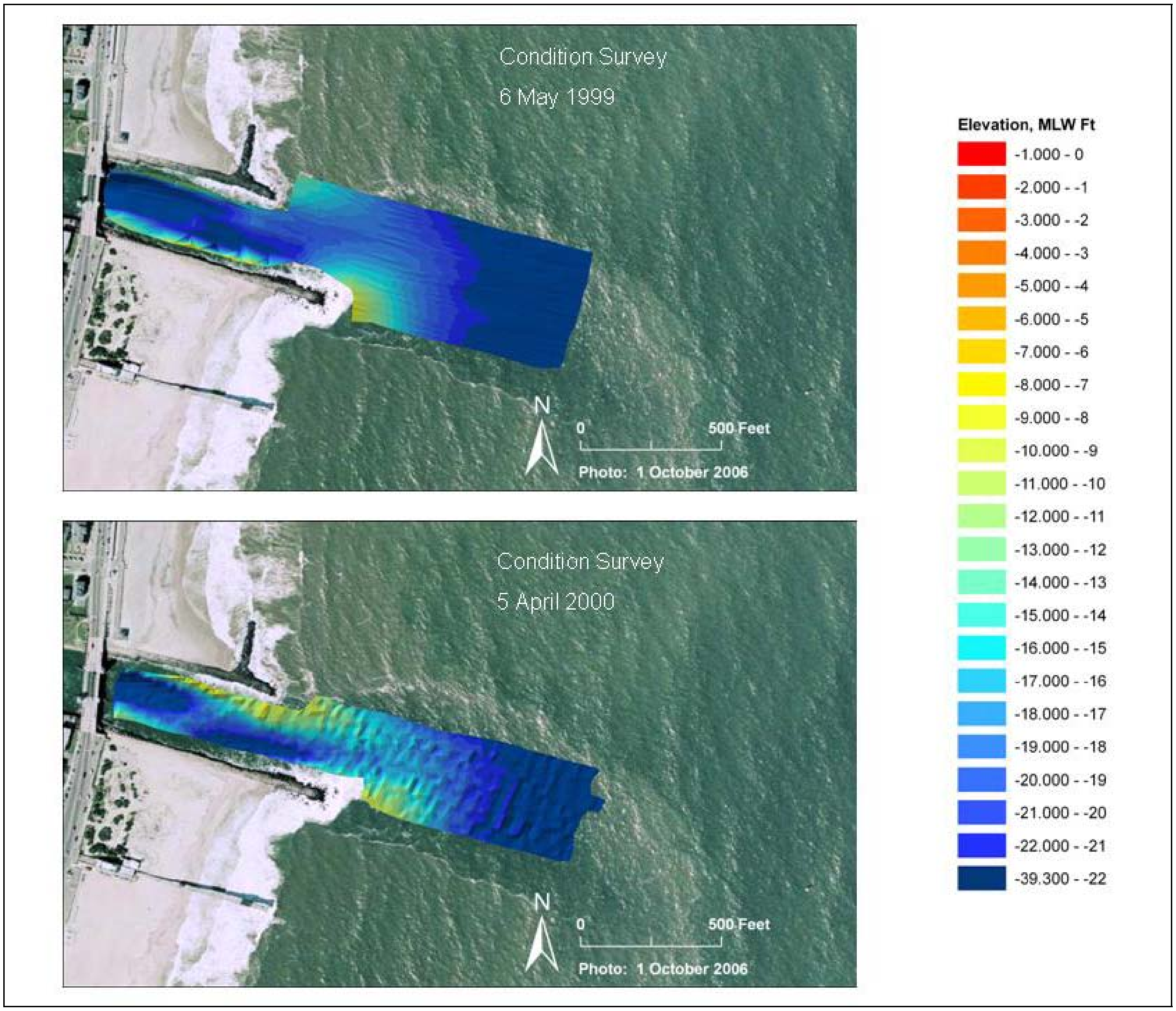

Figure 5. Shark River Inlet entrance, NJ, surveys of May 1999 and April 2000.

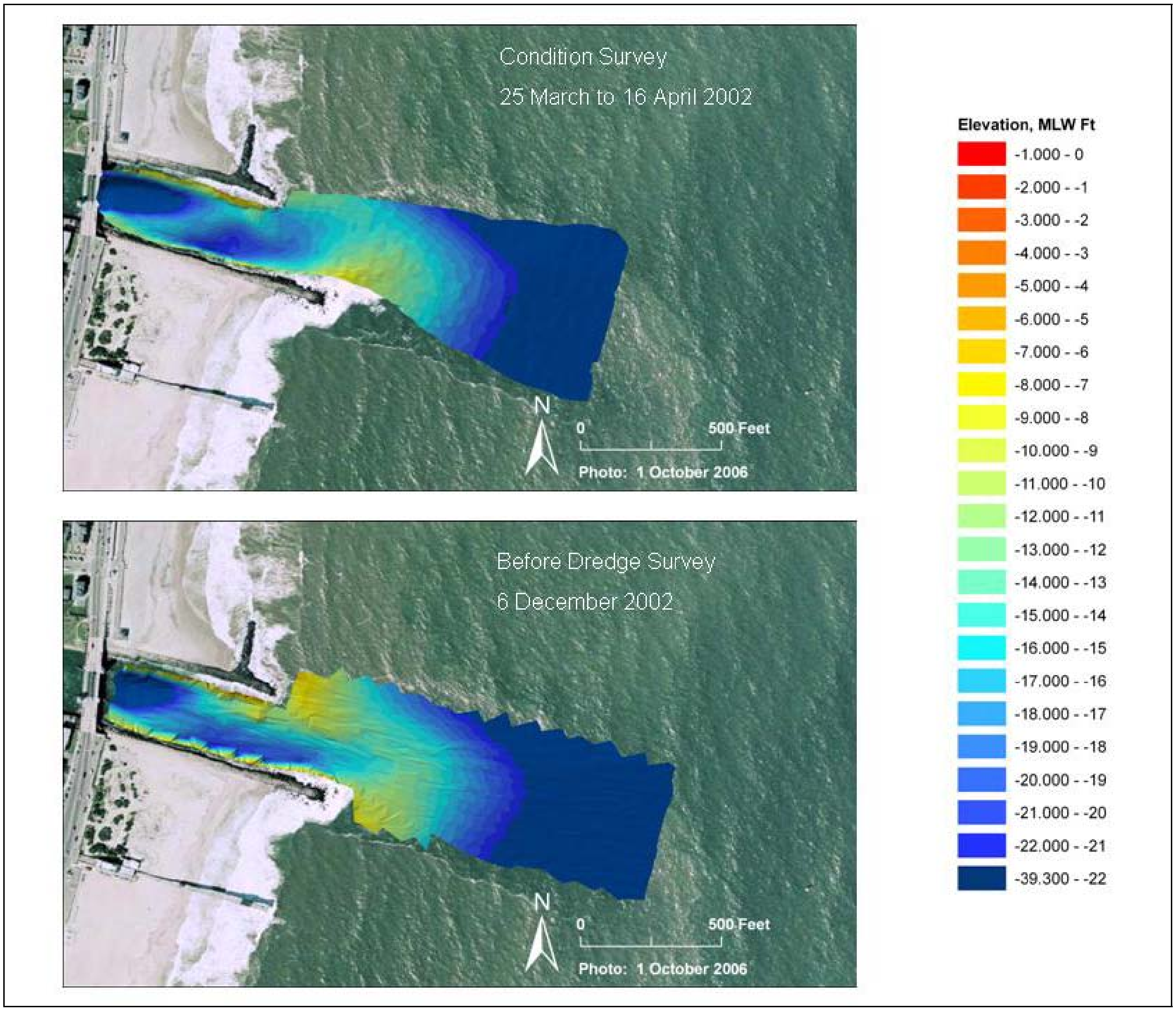

Figure 6. Shark River Inlet entrance, NJ, surveys of March-April 2002 and December 2002.

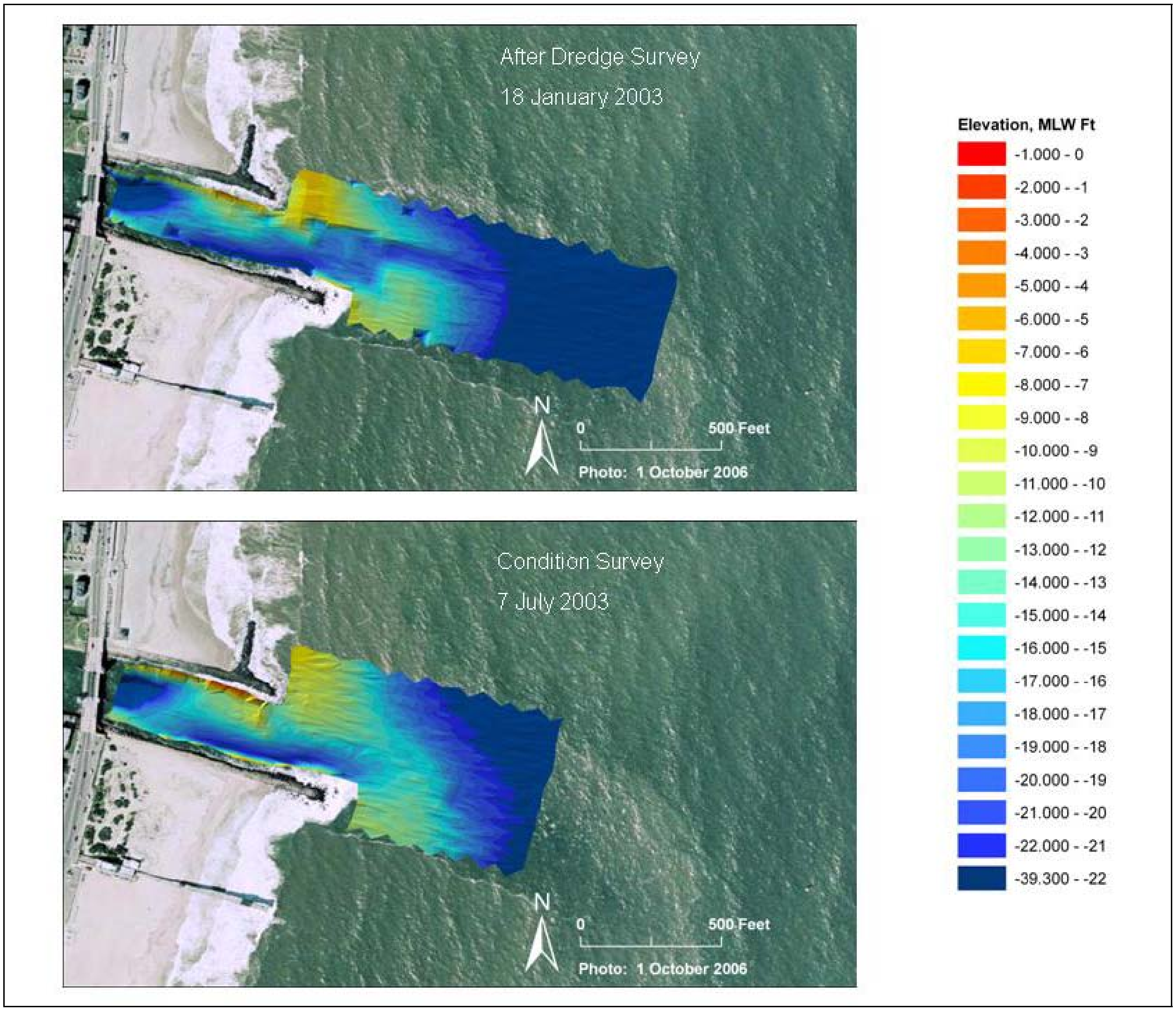

Figure 7. Shark River Inlet entrance, NJ, surveys of January 2003 and July 2003.

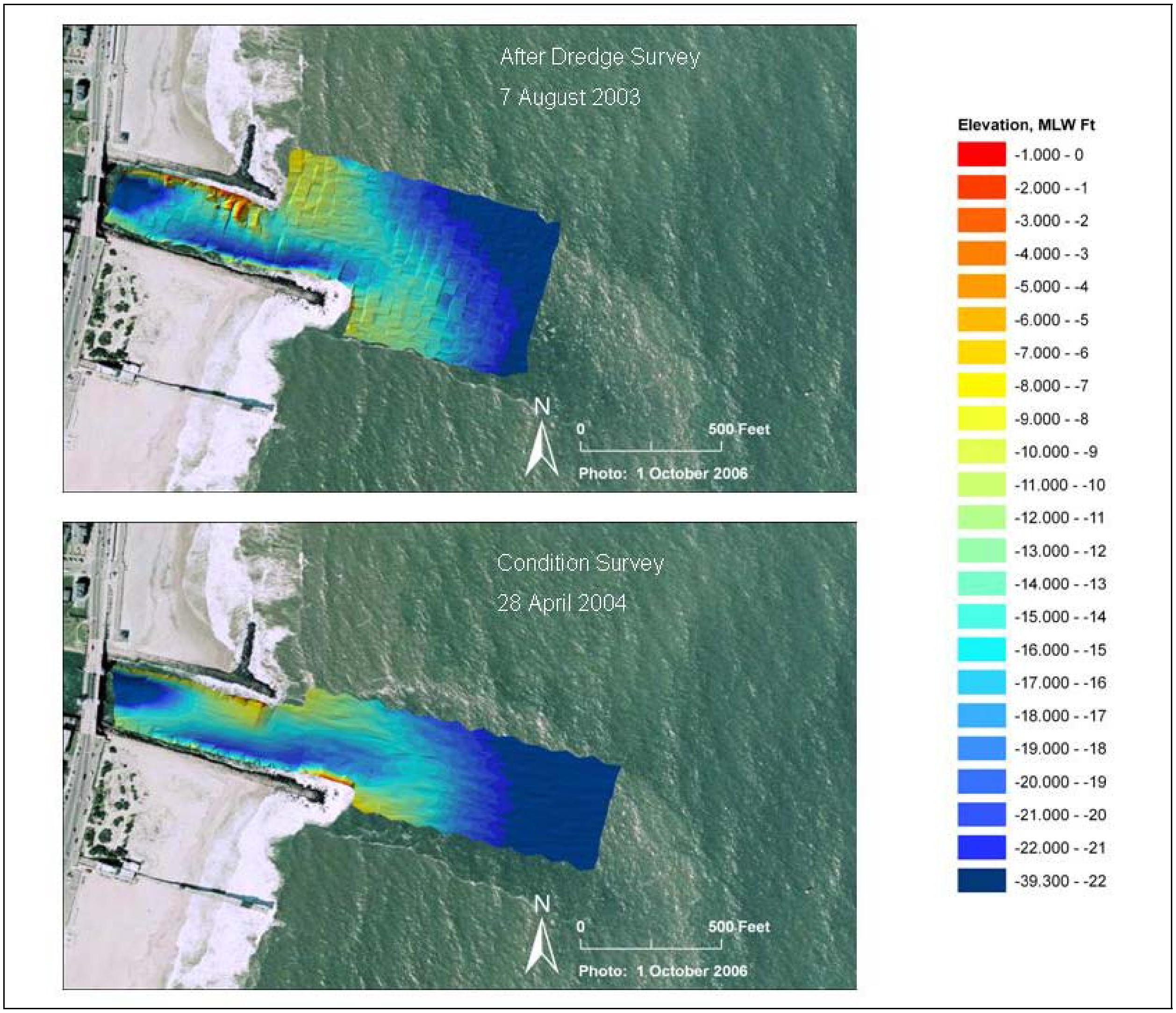

Figure 8. Shark River Inlet entrance, NJ, surveys of August 2003 and April 2004.

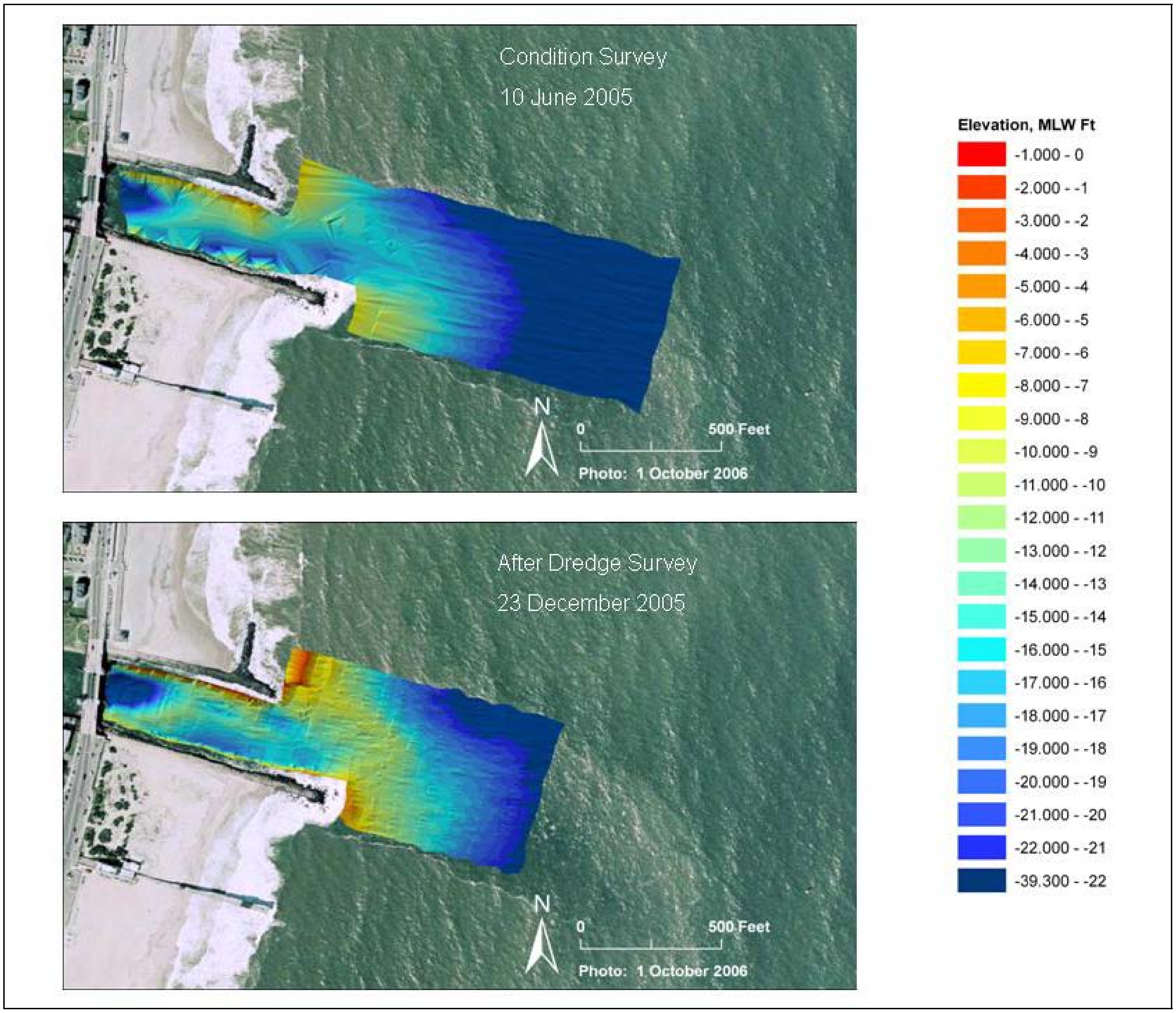

Figure 9. Shark River Inlet entrance, NJ, surveys of June 2005 and December 2005.

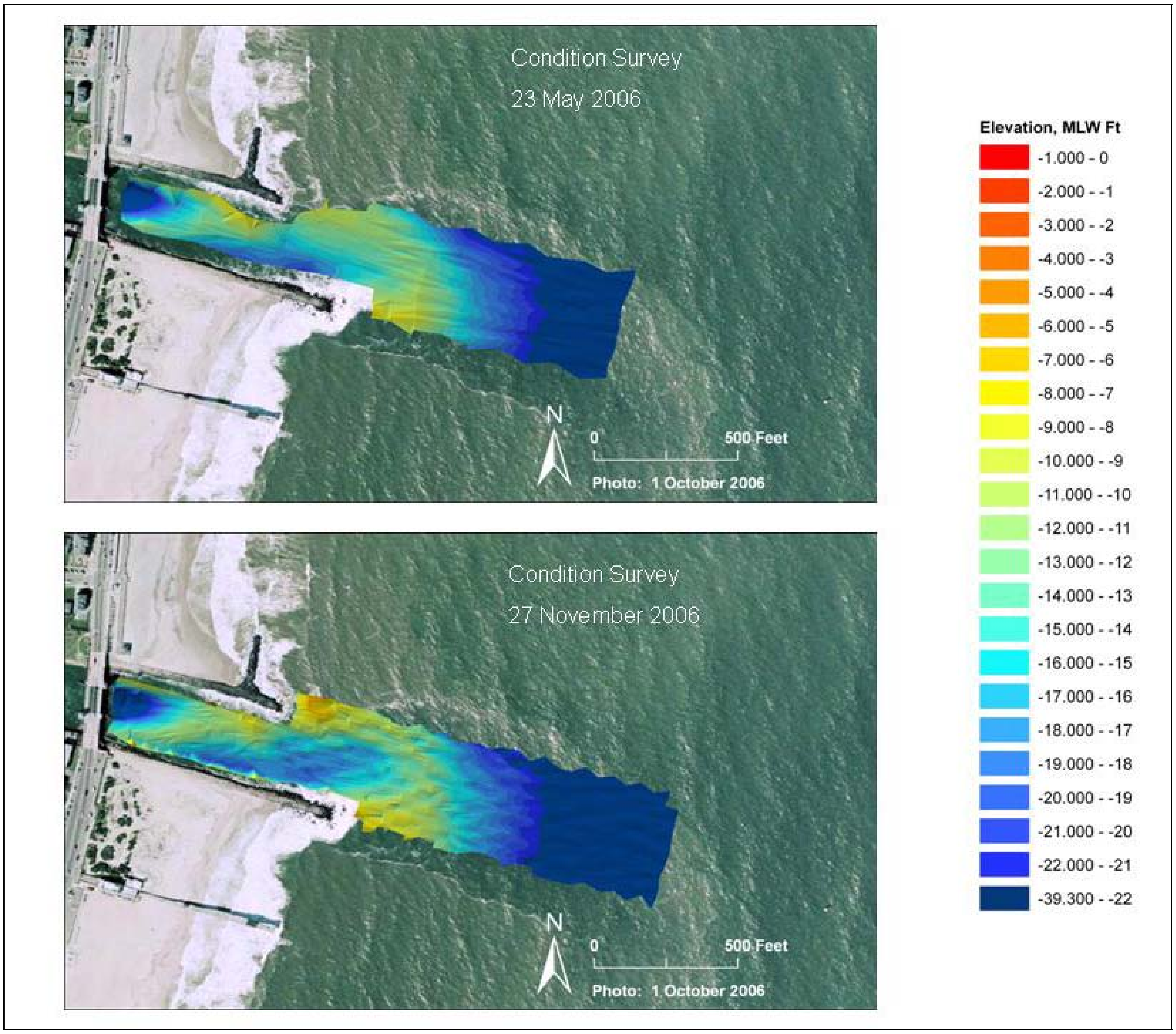

Figure 10. Shark River Inlet entrance, NJ, surveys of May 2006 and November 2006.

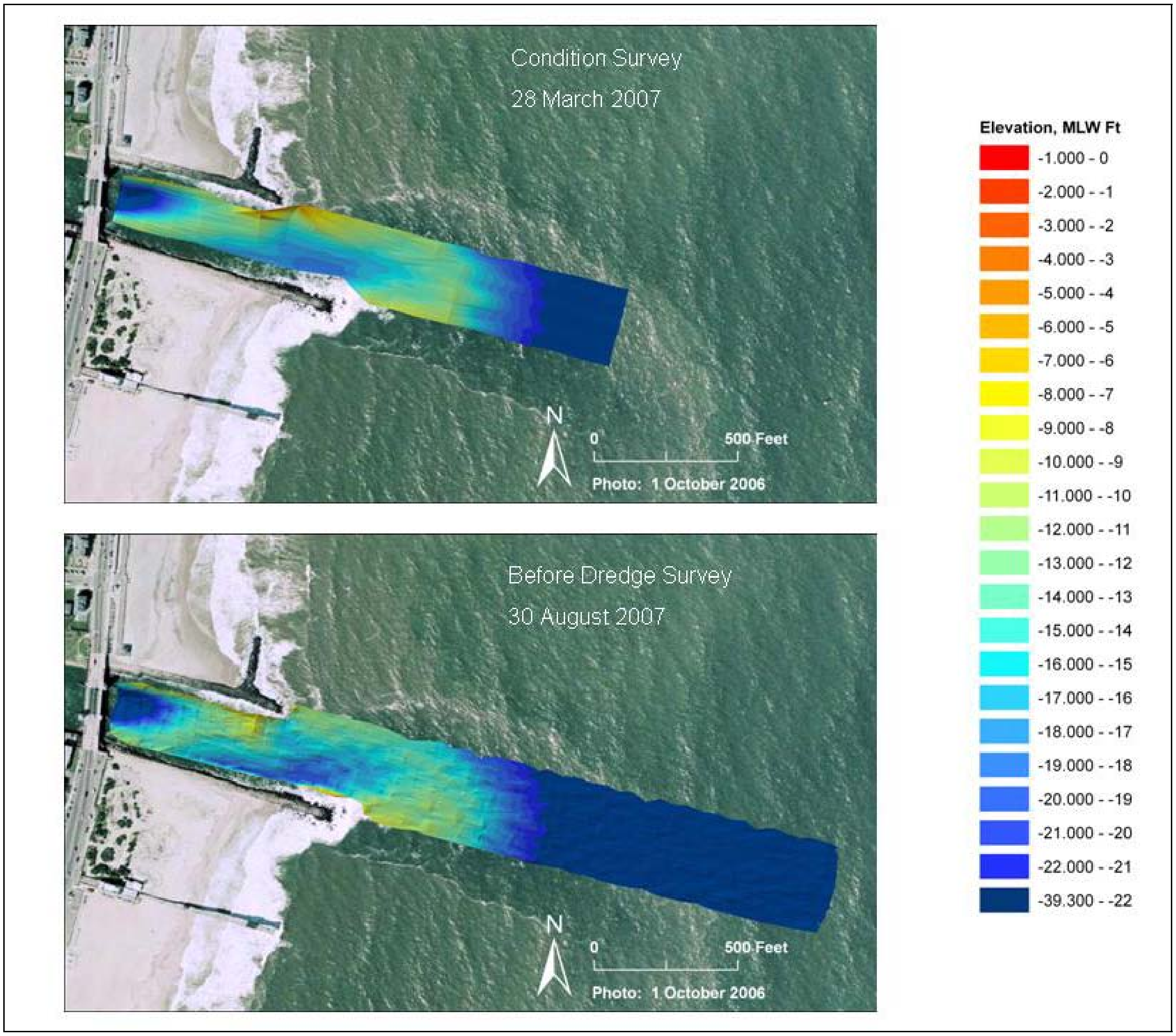

Figure 11. Shark River Inlet entrance, NJ, surveys of March 2007 and August 2007.

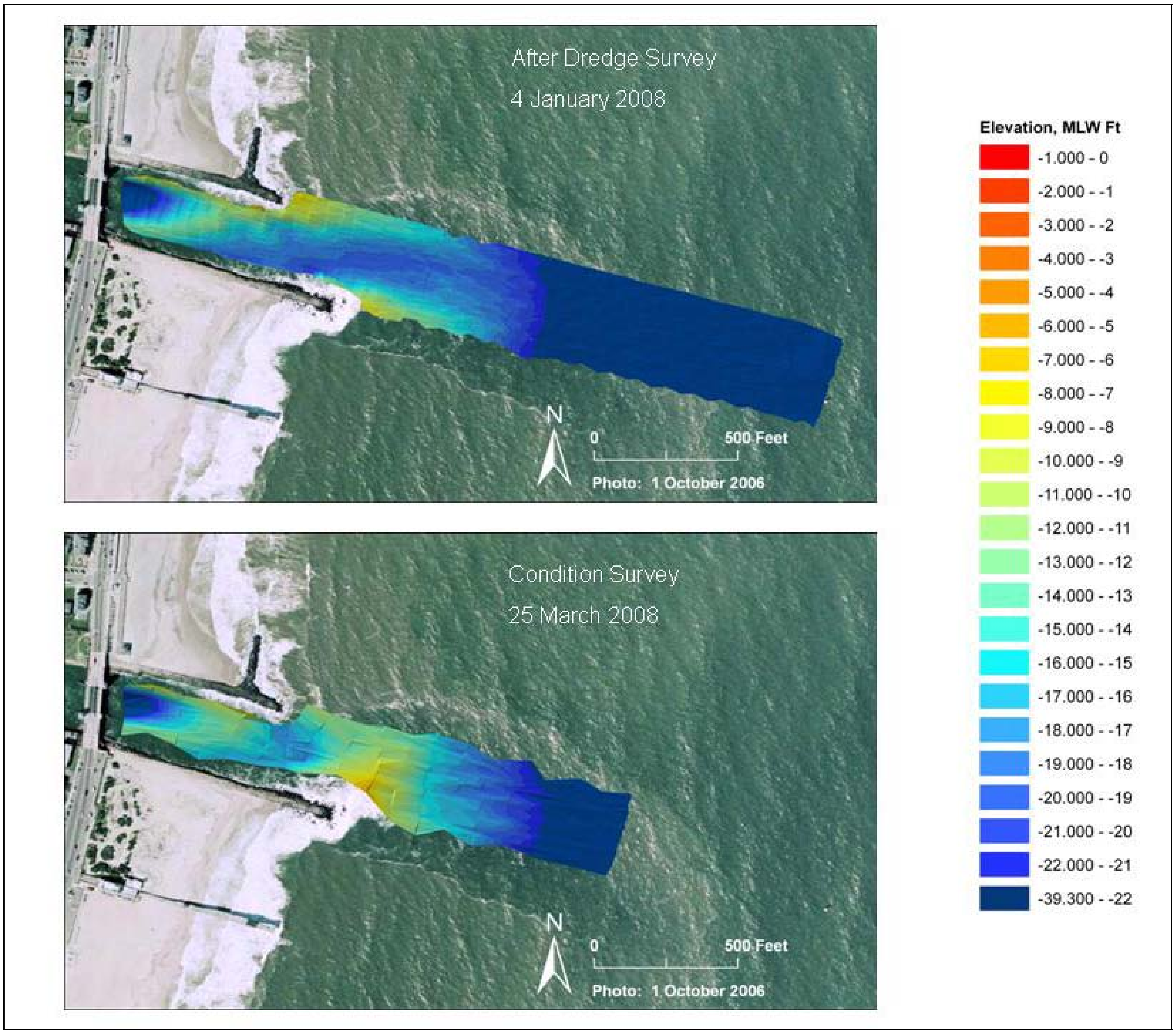

Figure 12. Shark River Inlet entrance, NJ, surveys of January 2008 and March 2008.

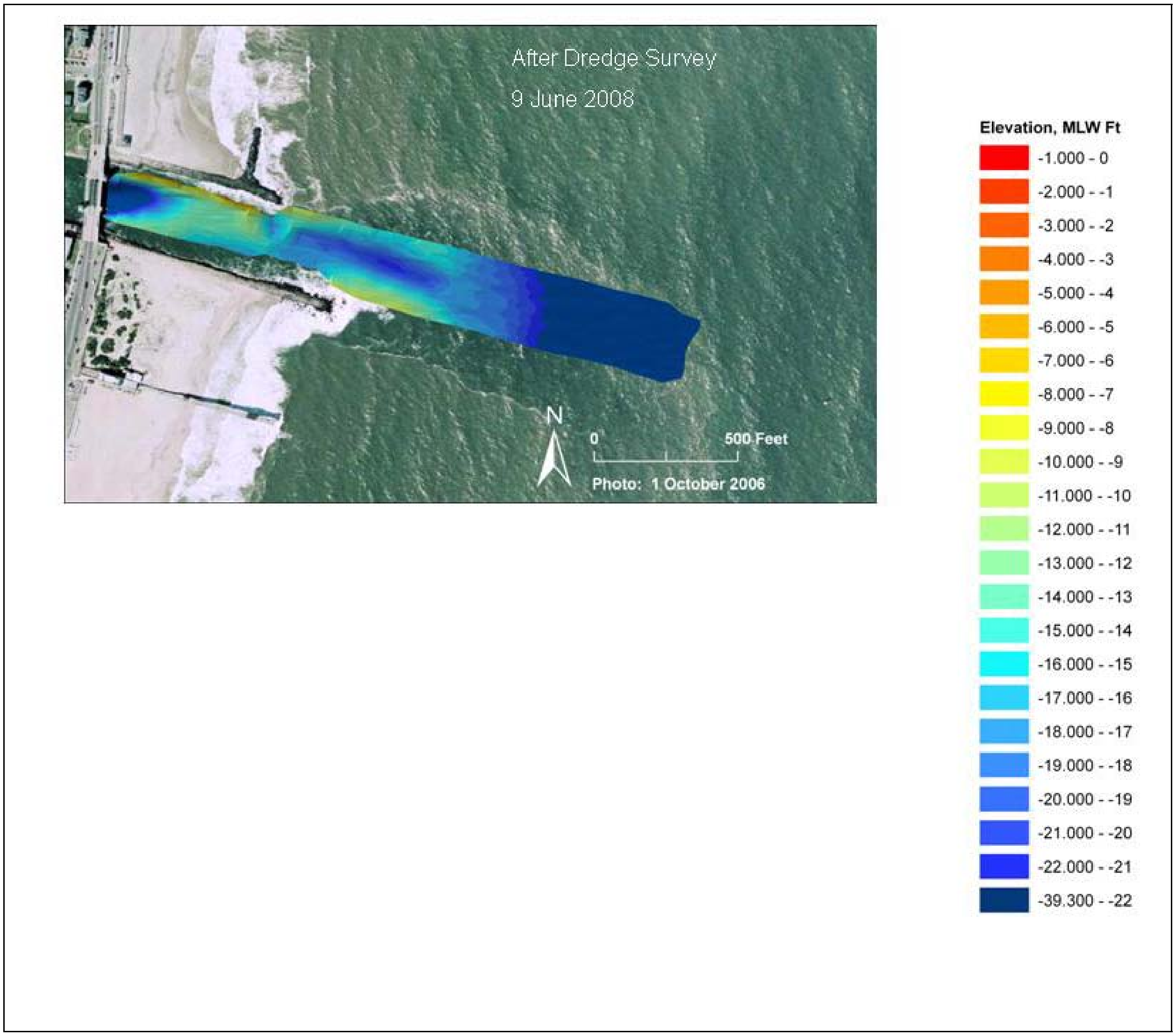

Figure 13. Shark River Inlet entrance, NJ, survey of June 2008.

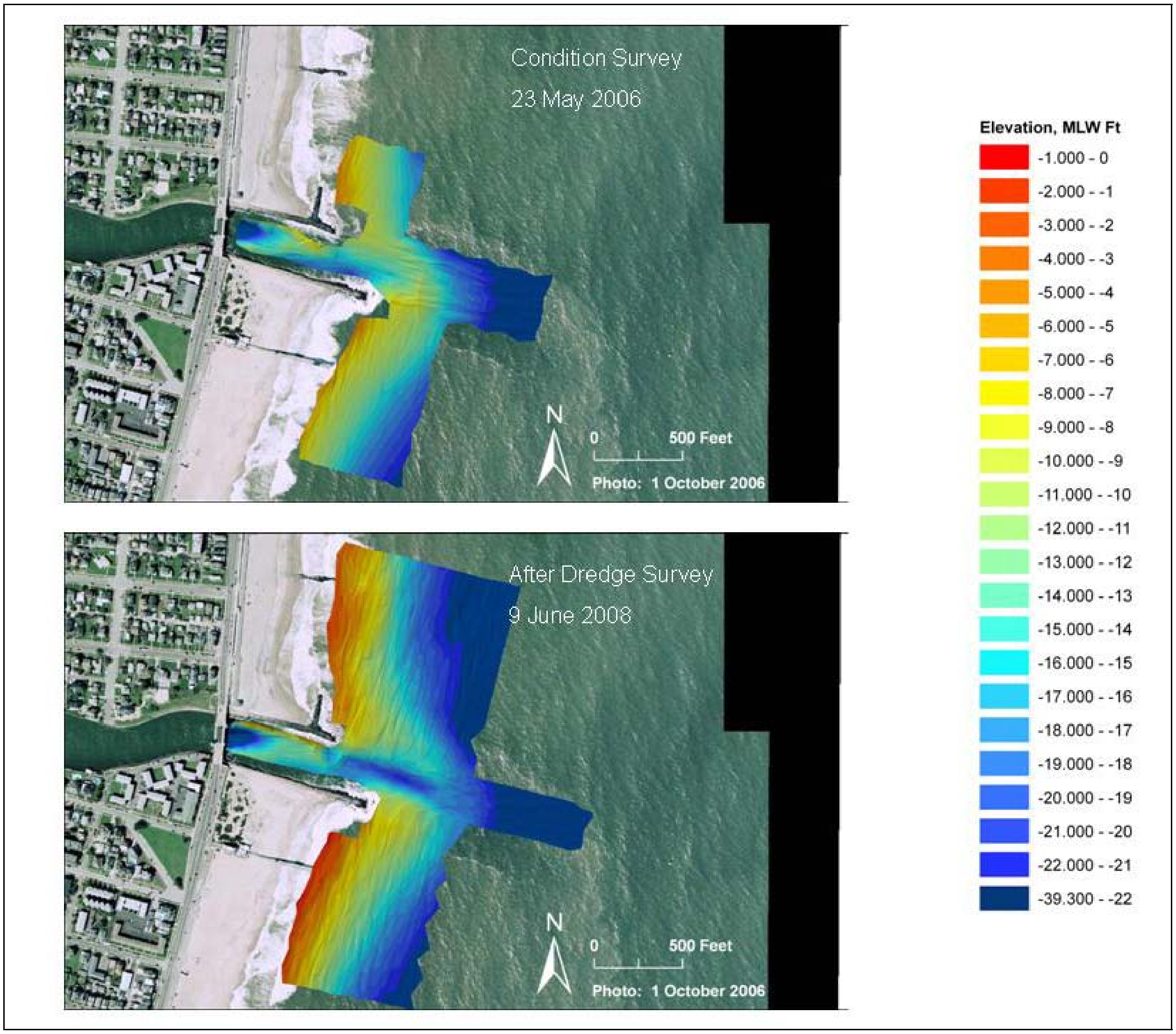

Figure 14. Shark River Inlet entrance, NJ, surveys of May 2006 and June 2008.

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13. SUPPLEMENTARY NOTES

14. ABSTRACT
This report documents a desk study performed to identify factors responsible for accelerated sand shoaling at the federally maintained entrance channel to Shark River Inlet, NJ. Since the late 1990s, channel maintenance dredging requirements at the inlet have increased. The study was proceeded by review of the engineering literature, analysis of channel and nearshore bathymetry surveys, and application of general principles of coastal and inlet processes. Although Shark River Inlet possesses a small back bay, the current through the inlet is strong because of the narrow width between jetties. In the past century, this coast was sand deficient. With recent beach nourishment projects as part of an erosion-control program, the longshore sand transport potential along the coast is becoming realized, allowing an ebb-tidal shoal to form at the entrance. This shoal is expected to increase in volume over the next two decades to reach about 1.2 million cubic yards. Therefore, the dredging maintenance strategy must transition to one similar to those at other small tidal inlets along the Atlantic Ocean coasts of New Jersey and New York.

15. SUBJECT TERMS

Beach	Inlet	Morphology
Coast	Longshore transport	Navigation channel
	Jetty	Tide

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